Remarks

We have amended claim 26 to correct a typographical error and to rephrase the element of the claim the requires "direct contact" between a portion of the metal chlorite and at least one acid forming component. "Direct contact" has been rephrased as "having no interposed material," with support being found in Example 1, page 26, line 23 to page 27, line 2; Example 2, page 27, line 25 to page 28, line 2; Example 3, page 28, lines 19-24; Example 4, page 29, lines 4-9; Example 5, page 29, lines 16-20; Example 6, page 30, lines 5-9; and Example 7, page 30, lines 14-22.

We have added claim 60 specify that the membrane must comprise kraft paper (support on page 22, line 9 of the specification).

We respectfully submit that the amended claim 26, and all claims depending therefrom, define an invention that is novel and non-obvious over the Derwent English abstract No. 1997-311227 of Chinese published patent specification 1104610A, because the reference fails to teach or suggest direct contact between a metal chlorite and acid forming component. The translated Chinese abstract teaches that sodium chlorite reactant must be encapsulated by Chinese wax, stearic acid, bees wax or paraffin wax. The material interposed between the sodium chlorite and the tartaric or oxalic acid creates a barrier that interferes with the sodium chlorite/acid reaction. The production of chlorine dioxide is accordingly hindered, or even prevented in areas where the barrier cannot be breached by the reaction medium, i.e., water. Furthermore, encapsulation is a relatively costly processing step, and encapsulation of a strongly oxidizing material, such as sodium chlorite, with combustible organic materials, like waxes, is dangerous due to the potentially explosive reaction that can occur between the two materials.

In contrast, the present invention requires that at least a portion of the metal chlorite and acid forming component have no interposed material between them, thereby promoting chlorine dioxide production, saving costs, and avoiding hazards relating to the prior art encapsulation.

In addition, the outstanding Office action suggests that when stearic acid is utilized as the encapsulating material in the cited reference, it would constitute an acid forming component in direct contact with the sodium chlorite as required in the claims. However, the acid forming component defined in claim 26 must be selected from one of the following materials: water soluble acids, water soluble acid salts, synthetic molecular sieves, acid ion exchange resins, acid treated clays and acid treated calcined clays. While stearic acid is an acid, it is not water soluble, as evidenced by the attached excerpt from *Handbook of Chemistry and Physics*, CRC Press (1974). Thus, stearic acid is not an "acid forming component" as required in the present claims.

In light of the forgoing, we respectfully submit that the claims, as amended, define a novel and non-obvious invention that fully merits patent protection. We therefore respectfully request that the entire application be allowed at an early date. If there remain any issues that the Examiner believes can be resolved by discussion, the Examiner is cordially invited to contact applicant's undersigned representative at the telephone number provided below.

This amendment is being submitted after three-months, but before four-months, from the December 18, 2002 mailing date of the outstanding Office action. We hereby request a one-month extension for response, and authorization is hereby granted to charge deposit Account No. 05-1070 for the associated fee. If any other fee is required in association with this response, we hereby request and authorize the charging of the fee to deposit Account No. 05-1070.

Respectfully submitted,

Russell G. Lindenfeldar
Reg. No. 39,750

Engelhard Corporation
101 Wood Avenue
P. O. Box 770
Iselin, NJ 08830-0770
(732) 205-5181

Version with markings to show changes made

Please amend claim 26 as follows:

26. (three-times amended) A device capable of producing an aqueous solution of chlorine dioxide when said device is placed into water, the device comprising a water-permeable membrane defining at least in part an enclosed space containing a mixture of at least one metal chlorite and at least one acid forming component, at least a [of] portion of said at least one metal chlorite and at least one acid forming component having no interposed material [being in direct contact], said acid forming component being selected from the group consisting of water soluble acids, water soluble acid salts, synthetic molecular sieves, acid ion exchange resins, acid treated clays and acid treated calcined clays, and wherein said metal chlorite and said acid forming component are such that they will react with each other in the presence of water but not in the substantial absence of water to produce chlorine dioxide, said membrane comprising a material which permits: (a) controlled passage of liquid water and/or water vapor into the enclosed space to thereby allow the metal chlorite and the acid forming component to react to produce chlorine dioxide and (b) passage of the so produced chlorine dioxide into a body of liquid water to produce the aqueous solution of chlorine dioxide.

Please add the following new claim 60:

60. (New) The device of claim 26, wherein the membrane comprises kraft paper.

Handbook
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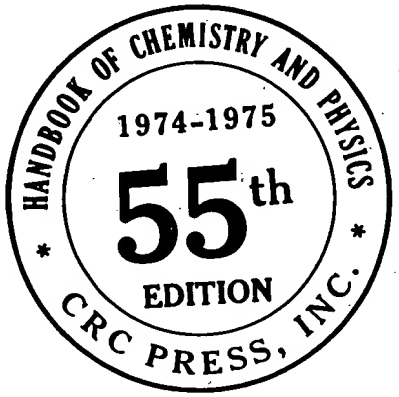
A Ready-Reference Book of Chemical and Physical Data



EDITOR

ROBERT C. WEAST, Ph.D.

Vice President, Research, Consolidated Natural Gas Service Company, Inc.
Formerly Professor of Chemistry at Case Institute of Technology

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SYMBOLS AND ABBREVIATIONS

[α]	specific rotation
δ	slightly
>	above, more than
<	below, less than
∞	soluble in all proportions
*	name approved by the International Union of Chemists (I.U.C.)[1]
Ω	IR, or UV, or NMR spectra referenced
?	unknown
aa	acetic acid
abs	absolute
ac	acid
Ac	acetyl
ace	acetone
al	alcohol[2]
alk	alkali
Am	J. Am. Chem. Soc.
Am	amyl (pentyl)
amor	amorphous
anh	anhydrous
aqu	aqueous
as	asymmetric
atm	atmospheres
b	boiling
B	Beilstein
Ber	Chem. Ber.
bipym	bipyramidal
bk	black[3]
bl	blue[3]
br	brown[3]
bt	bright
Bu	butyl
bz	Benzene
C	Chem. Abs.
c	percentage concentration
ca	about (circa)
chl	chloroform
co	columns
col	colorless
con	concentrated
cor	corrected
cr	crystals
cy	cyclohexane
d	decomposes
D	line in the spectrum of sodium (subscript)
D, d	dextro[4]
δd	slight decomposition
dil	diluted
diox	dioxane
distb	distillable
dk	dark
Dl, dl	racemic[4]
dlq	deliquescent
DMF	dimethyl formamide
E	Elsevier's
eff	efflorescent
Et	ethyl
eth	ether[5]
exp	explodes
extrap	extrapolated
fl	flakes
flr	fluorescent
fr	freezes
fr. p.	freezing point
fum	fuming
gel	gelatinous
gl	glacial
gold	golden
gr	green[3]
gran	granular
gy	gray[3]
h	hot
H	Helv. Chim. Acta
hex	hexagonal
hp	heptane
htng	heating
hx	hexane
hyd	hydrate
hyg	hygroscopic
i	insoluble
i-	iso-
ign	ignites
in	inactive
inflam	inflammable
infus	infusible
irid	iridescent
iso	isooctane
J	J. Chem. Soc.
JOC	J. Org. Chem.
L, l	levo[4]
la	large
lf	leaf
lig	ligroin
liq	liquid
lo	long
lt	light
m	melting
m-	meta-
M	molar (concentration)
M	Merck Index, 7th Edition
mcl	monoclinic
Me	methyl
met	metallic
micr	microscopic
min	mineral
mod	modification
mut	mutarotatory
n	normal chain, refractive index
N	normal (concentration)
N	nitrogen[6]
nd	needles
o-	ortho-
oct	octahedral
og	orange[3]
oos	ordinary organic solvents
or	or
ord	ordinary
org	organic
orh	orthorhombic
os	organic solvents
p-	para-
pa	pale
par	partial
peth	petroleum ether
pk	pink[3]
Ph	phenyl
pl	plates
pr	prisms
Pr	propyl
Prak	J. Prak. Chem.
purp	purple[3]
pw	powder
Py	pyremidine
pym	pyramids
rac	racemic
rect	rectangular
red	red
res	resinous
rh	rhombic
rhd	rhombohedral
s	soluble
s	secondary[7]
sc	scales
sec	secondary[7]
sf	softens
sh	shoulder
silv	silvery
sl	slightly (δ)
so	solid
sol	solution
solv	solvent
sph	sphenoidal
st	stable
sub	sublimes
suc	supercooled
sulf	sulfuric acid
sym	symmetrical
syr	syrup
t	tertiary[7]
ta	tablets
tcl	triclinic
tert	tertiary[7]
Tet	Tetrahedron
tetr	tetragonal
THF	tetrahydrofuran
to	toluene
tr	transparent
trg	trigonal
undil	undiluted
uns	unsymmetrical
unst	unstable
v	very
vac	vacuum
var	variable
vap	vapor
vic	vicinal
visc	viscous
volat	volatile or volatilises
vt	violet[3]
w	water
wh	white[3]
wr	warm
wx	waxy
ye	yellow[3]
xyl	xylene

1 For I.U.C. rules of nomenclature see General Index.
2 Generally means ethyl alcohol.
3 The abbreviation of a color ending in "sh" is to be read as ending with the suffix "-ish," *e.g.*, grsh means greenish.
4 *D, L* generally mean configuration and *d, l* generally mean optical rotation;, but there are many examples in the chemical literature for which the meaning of these symbols is ambiguous and/or interchangeable.
5 Generally means diethyl ether.
6 *N* indicates a position in the molecule.
7 *s* and *sec*, or *t* and *tert*, are used as convenient.

No.	Name	Synonyms and Formula	Mol. wt.	Color, crystalline form, specific rotation and λ_{max} (log ε)	m.p. °C	b.p. °C	Density	n_D	Solubility: w	al	eth	ace	bz	other solvents	Ref.
	Octacosane	$CH_3(CH_2)_{26}CH_3$	394.78	mcl or rh (bz-al)	64.5 fr 61.4	431.6^{760} 264^{10}	0.8067$^{20}_4$ 0.7750^{70}	1.4520^{20} 1.4330^{70}	i	...	...	∞	s	chl s	B1^3,582
o1	**Octacosanoic acid***	$CH_3(CH_2)_{26}CO_2H$	424.76	(ace or aa)	90.4	...	0.8191^{100}	1.4313^{100}	...	...	...	...	...	...	B2^2,1095
o2	**1-Octacosanol***	$CH_3(CH_2)_{27}OH$	410.78	(ace or peth)	83.3	sub 200–50^1	...	...	...	...	...	...	...	...	B1^3,1849
o3	**9,12-Octadecadienoic acid (*cis,cis*)***	Linoleic acid. $CH_3(CH_2)_4CH{:}CHCH_2CH{:}CH(CH_2)_7CO_2H$	280.46	pa ye or col λ^{al} 232 (3.8), 275 (2.9)	−5	229–30^{16}	0.9022$^{20}_4$	1.4699^{20}	i	∞	∞	∞	∞	chl, CCl_4, MeOH ∞	B2^2,459
o4	—.ethyl ester*	Ethyl linoleate. $CH_3(CH_2)_4CH{:}CHCH_2CH{:}CH(CH_2)_7CO_2C_2H_5$	308.49	ye or col λ^{hx} 198 (4.6), λ^{al} 233 sh (2.1), 270 (1.79)	...	270–5^{180} 212^{12}	0.8865$^{20}_4$	...	i	s	s	...	...	...	B2^2,461
o5	—.methyl ester*	Methyl linoleate. $CH_3(CH_2)_4CH{:}CHCH_2CH{:}CH(CH_2)_7CO_2CH_3$	294.48	ye or col λ^{al} 232 (3.78)	−35	215^{20} 168–70^3	0.8886$^{18}_4$	1.4638^{20}	i	s	s	...	...	...	B2^2,461
o6	**10,12-Octadecadienoic acid (*trans,trans*)***	10,12-Linoleic acid. $CH_3(CH_2)_4CH{:}CHCH{:}CH(CH_2)_8CO_2H$	280.45	(bz or al) λ^{al} 233 (3.51)	56–7.5	...	0.8686$^{20}_4$	1.4689^{60}	...	...	...	...	...	...	B2^2,461
o7	**7,11-Octadecadiyne***	$CH_3(CH_2)_5C{:}CCH_2CH_2C{:}C(CH_2)_5CH_3$	246.44	...	...	167–8^7	0.8414^{19}	1.4698^{19}	i	...	...	...	...	...	B2^2,1476
o8	**Octadecanal***	Stearaldehyde. $CH_3(CH_2)_{16}CHO$	268.49	nd (peth)	55 (38–9)	261 212–3^{12}	...	...	i	...	...	...	...	...	B2^2,1068
o9	—.dimethyl acetal	1,1-Dimethoxyoctadecane*. $CH_3(CH_2)_{16}CH(OCH_3)_2$	314.56	...	...	168–70^3	...	1.4410^{25}	...	v	v	...	...	MeOH v	B1^2,772
o10	**Octadecane***	$CH_3(CH_2)_{16}CH_3$	254.51	nd (al or eth-MeOH)	28.18	316.1^{760} 173.5^{10}	0.7768$^{28}_4$	1.4390^{20}	i	δ	s	s	...	lig s	Am 80, 6613
o11	—.1-amino-*	$CH_3(CH_2)_{17}NH_2$	269.52	(w)	fr 52.86	348.8^{760} 199.5^{10}	0.8618$^{20}_4$	1.4522^{20}	i	s	s	δ	s	chl v	B1^3,565
o12	—.—.acetate	$CH_3(CH_2)_{17}NH_2 \cdot CH_3CO_2H$	329.57	nd (al), cr (bz)	fr 84.5	...	...	...	i	v	...	...	s	...	B4^3,431
o13	—.—.hydrochloride	$CH_3(CH_2)_{17}NH_2 \cdot HCl$	305.98	orh pl (al)	162–3	...	...	...	s^h	δ	...	...	i	...	B4^3,433
o14	—.1-bromo-*	$CH_3(CH_2)_{17}Br$	333.41	cr (al)	28.2	210^{10}	0.9848$^{20}_4$	1.4631^{20} 1.4594^{30}	v^h	v^h	i	...	...	...	B4^3,432
o15	—.1-chloro-*	$CH_3(CH_2)_{17}Cl$	288.95	...	28.6	348^{760} 199^{10}	0.8641^{20}	1.4531^{20}	i	s	s	...	...	peth, AcOEt s	B1^3,567
o16	—.1-chloro-*	$CH_3(CH_2)_{17}Cl$	288.95	...	28.6	348^{760} 199^{10}	0.8641^{20}	1.4531^{20}	i	...	...	...	...	...	B1^3,566
o17	—.1,18-dibromo-*	$Br(CH_2)_{18}Br$	412.31	nd or lf (al)	64	205–7^{15}	...	...	i	δ	...	...	...	chl v	B1^2,139
o18	—.1-iodo-*	$CH_3(CH_2)_{17}I$	380.40	lf (lig), nd (ace or al-ace)	34	383^{760} 223^{10}	1.0994$^{20}_4$	1.4810^{20}	i	v^h	δ	...	...	...	B1^3,567
o19	**Octadecanedioic acid, diethyl ester***	Diethyl eicosanedioate. $C_2H_5O_2C(CH_2)_{16}CO_2C_2H_5$	370.58	...	54.5–5.0	240^{12}	...	...	i	δ	δ	...	...	...	B1^3,1838
o20	**1,18-Octadecanediol***	$HO(CH_2)_{18}OH$	286.50	lf (al, AcOEt or bz), nd (bz, diox)	97–9	210–1^2	...	...	i	s	...	...	...	...	B2^2,346
o21	**1-Octadecanethiol***	*n*-Octadecyl mercaptan. $CH_3(CH_2)_{17}SH$	286.57	...	(i) 24–6 (ii) 28	188$^{1-2}$	0.8475^{20}	1.4645^{20}	i	δ	s	...	...	...	B2, 384
o22	**Octadecanoic acid***	Stearic acid. $CH_3(CH_2)_{16}CO_2H$	284.50	mcl lf (al) λ^{al} 210 (1.69)	71.5–2.0	360d 232^{15}	0.9408$^{20}_4$	1.4299^{80}	i	s^h δ	v	s	δ	chl, CCl_4, CS_2, to s	B12^2,148
o23	—.amide	Stearamide. $CH_3(CH_2)_{16}CONH_2$	283.50	lf (al)	109	250–1^{12}	...	...	i	s^h δ	s	δ	δ	chl s	B2^2,360
o24	—.—.*N*-phenyl-	Stearanilide. $CH_3(CH_2)_{16}CONHC_6H_5$	359.60	nd (al)	94	153.5^{10}	...	...	i	v	v	s	v	chl s peth δ	B6^2,418
o24^1	—.anhydride*	Stearic anhydride. $[CH_3(CH_2)_{16}CO]_2O$	550.96	λ^{al} 243 (4.17)	72	...	0.8368$^{82}_4$	1.4362^{80}	i	i	δ	...	δ	...	B2^2,352
o25	—.benzyl ester	Benzyl stearate. $CH_3(CH_2)_{16}CO_2CH_2C_6H_5$	374.61	pa ye	28 (45–6)	...	0.9075$^{50}_{25}$	1.4663^{50}	i	δ	δ	...	...	chl δ	B2, 384
o26	—.butyl ester*	*n*-Butyl stearate. $CH_3(CH_2)_{16}CO_2(CH_2)_3CH_3$	340.60	...	27.5	223	0.8552$^{20}_4$	1.4328^{50}	i	s	...	v	...	...	B6^2,11
o27	—.chloride	Stearyl chloride. $CH_3(CH_2)_{16}COCl$	302.93	...	23	215^{15} 202–3^6	...	1.4523^{24}	...	s^h	...	...	...	...	B2^2,379
o28	—.cyclohexyl ester*	...	366.64	...	44 (28–9)	...	0.8902$^{25}_{25}$	...	i	i	s	...	...	...	B2^2,353
o29	—.ethyl ester*	Ethyl stearate. $CH_3(CH_2)_{16}CO_2C_2H_5$	312.54	...	(i) 33.4 (ii) 30.9	199^{10}	1.0574$^{20}_4$ (0.8973^{25})	1.4349^{40}	i	s	s	v	...	...	B2^2,353
o30	—.hexadecyl ester*	Cetyl stearate. $CH_3(CH_2)_{16}CO_2(CH_2)_{15}CH_3$	508.92	lf or pl (eth, aa)	57	...	...	1.4410^{70}	i	i	s	s	i s^h	chl, CS_2 s aa i	B2^2,353
o30^1	—.2-hydroxyethyl ester*	Glycol monostearate. $CH_3(CH_2)_{16}CO_2CH_2CH_2OH$	328.54	(peth)	60–1	189–91^3	0.8780$^{60}_4$	1.4310^{60}	...	δ	s^h	...	...	...	B2^2,1020
o31	—.isobutyl ester	Isobutyl stearate. $CH_3(CH_2)_{16}CO_2CH_2CH(CH_3)_2$	340.60	wax	(i) 22.5 (ii) 28.9	223^{15} 199^5	0.8498$^{20}_4$	...	i	...	s	...	...	...	B2^2,353

For explanations, symbols and abbreviations see beginning of table. For structural formulas see end of table.